UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

Health and Safety
District C

Mount Hope, West Virginia
December 1, 1961 wjp

Memorandum

To: W. R. Park, District Supervisor

From: J. L. Gilley, Mining Health and Safety Engineer

Subject: Investigation of minor coal outburst accident, Road 526 Section, Dehue Mine, Youngstown Mines Corporation, Dehue, Logan County, West Virginia, October 25, 1961

A coal outburst (bump) in an open-end lift in No. 5 pillar of Road 526 Section in the Dehue mine, Youngstown Mines Corporation at 6:00 p.m. on Wednesday, October 25, 1961, resulted in minor injuries to Arbit Pack, a timberman. Following the bump, Pack walked to the entrance of the pillar lift where he was examined by the night mine foreman and section foreman, and after receiving necessary first-aid treatment, was taken to a hospital in Logan, West Virginia for further treatment and observation. Pack's injuries consisted of a bruise of the right knee and hip and reportedly, an aggravation of an old injury to the right ear drum. Of the 12 employees on the section at the time of the outburst, Pack was the only workman injured, and no damage to equipment was incurred.

A joint investigation of the outburst accident was made by Messrs. M. M. Fitzwater, mine superintendent, Pearly Davis, general mine foreman, and T. Curry, safety inspector, James Whalen, Federal coal-mine inspector and the writer on October 30, the first day the mine operated after the accident. The scene of the accident had not been disturbed. The mine was operating 3 days a week at the time.

The Dehue mine is opened by 7 shafts and 2 slopes and operates in the high-volatile Eagle coal bed, which averages 60 inches in thickness. The height of the coal in the immediate area involved in the outburst varied from 56 to 64 inches. The coal is characteristically black and shiney, possesses a comparatively high degree of hardness, but is friable. The

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face and butt cleavage planes are not pronounced in the Eagle coal bed. The coal was loaded with 14 BU Joy loaders into shuttle cars, cut with 10 RU Jeffrey cutting machines, and blasted with permissible explosives.

Localized dispositional changes in the immediate and main roof structures occur in many parts of the mine. The roof contacting the coal at some locations is comprised of gray sandstone ranging from a few inches to 60 feet in thickness; the immediate roof, however, at other locations consists of thinly bedded dark gray shale ranging up to about 17 feet in thickness and is overlain by beds of shaley sandstone and/or sandy shales 15 feet or more in thickness. The immediate roof in the area involved in the outburst was comprised of irregularly laminated sandstone 10 feet or more in thickness, and contained intercalated coal spores. Logs of drill holes on the property indicate several beds of sandstone some of which range from 30 feet to 166.5 feet in thickness. Bed separation seems to take place rather easily at various horizons above the coal bed during or following pillar mining; this displacement with successive bending of the overlying members likely results in a load equal to part of their weight being exerted (and probably accelerated in some instances) upon the coal pillars in the working area. Observing falls in adjacent previously pillared area, it appeared that good breaks had occurred soon after mining of 2 or more lifts from a pillar. Sloughing or "squeezing" of the coal along the rib of pillars in development has been observed in some areas in this mine in the past as well as in the abutement zones of some of the present pillaring areas. The maximum cover over the coal bed is 1,350 feet, and the thickness of the cover overlying Road 526 Section ranged from 1,150 to 1,295 feet.

The mine floor is predominately hard, dense shale or siltstone that normally resists heaving, but the floor heaves under excessive pressure and is affected adversely by water. Very little heaving was in evidence in the Road 526 Section; however, the floor was affected to some extent locally by the outburst.

The mine was developed by a room-and-pillar method. Main entries were driven in sets of 4 and 6. Room entries were developed 2 and 3 abreast at intervals of 300 feet and crosscuts were on 80-foot centers. Entries and entry crosscuts were driven 16 to 18 feet in width and rooms were projected 20 feet in width.

Pillars were extracted by alternate open-end pillar lifts 20 to 22 feet in width; the pillar lifts were mined simultaneously in the individual pillars and precaution was taken not to cut the pillar lifts together before holing into the gob. In the Road 526 Section, 5 parallel entries had been driven to a predetermined distance on 80-foot centers from Road 510 with crosscuts at 80-foot intervals, thus forming pillars about 62 feet square. The pillar lines normally comprise 5 or 6 pillars that were mined on a 45-degree extraction line. From Sketch B, it will be noted that the Road 526 pillar line, which was nearing completion, comprised the rows of pillars between Roads 526 and 527. The pillars were being mined on a 45-degree fracture line and the maximum length of the extraction line was 550 feet. From Sketch B, it will be further noted that the Road 526 pillar section was flanked on the right

side by a previously mined-out area (Road 527 Section) with the No. 5 pillar situated next to this old gob area. The No. 5 pillar was not mined in proper sequence nor in proper alignment. This fact, subsequently, not only resulted in the No. 5 pillar being the focus of a critical pillar-line point, but ultimate mining of the pillar, in effect, was between gobs.

Wedge-type roof bolts 1 inch in diameter and 4 feet in length and supplemented with 3-piece timber sets where necessary were used to support the roof in Road 526 Section. Three-piece timber sets and posts installed, as indicated in Sketch A, were used to support the roof in mining the pillars.

The outburst occurred in an open-end pillar lift off the crosscut side of No. 5 pillar (actually the crosscut side of Road 526-D entry). The No. 5 pillar was originally approximately 62 feet square; however, at the time of the outburst, the pillar had been reduced in dimensions by an open-end lift driven the previous day across the back of the pillar from the No. 4 entry (Road 526-D) and by the active lift involved in the outburst and which lacked 14 feet from cutting into the completed lift on the opposite or inby side of the pillar.

On the day of the accident the night-shift section crew arrived on the section about 4:20 p.m., and at 4:35 p.m., the Joy loading machine started loading coal from a scrap cut in the No. 1 pillar. After the coal from the scrap cut was loaded, the loading equipment was moved into the No. 5 pillar lift where a cut of coal had been prepared by the day-shift crew near the end of the shift. This cut of coal was cleaned up and, reportedly, inasmuch as "the pillar seemed to 'work'," 2 or 3 additional shuttle cars of coal were mined beyond the limit of the cut by digging the coal with the loading machine "on the solid" from the face and left rib of the pillar lift. After the loading operation was completed in the No. 5 pillar lift, the loading machine was trammed into No. 4 pillar (see Sketch B) where a cut of coal had been prepared by the day-shift crew. After the loading machine was trammed out of No. 5 pillar lift, the necessary roof-support materials were delivered and Arbit Pack, timberman, and Will Alexander and Carlos Hannah, timbermen helpers, began installing crossbars and timbers according to plan in the No. 5 pillar lift. Three crossbars and several timbers had been installed by the workmen prior to the outburst, and at the time of the outburst, Pack and Alexander were in the process of sawing a timber at the location indicated in Sketch A, for placement under the right end of the fourth or inby crossbar. Hannah, in the meantime, had gone out of the place to obtain a timber tool and was outby the entrance to No. 5 pillar lift when the "bump" occurred.

Location of the men and equipment and the extent of mining in the Road 526 Section at the time of the coal outburst are indicated in Sketch B and the specific area involved in the outburst is indicated in detail in Sketch A. From Sketch A, it will be noted that the pillar lift had been driven 41 feet along the gob side of the pillar and lacked 14 feet from cutting into the completed alternate lift on the opposite side of the pillar. It will further be noted that the left rib of the open-end pillar lift had not been mined straight (on a 90-degree angle from the crosscut side of the pillar),

but on the contrary, had been angled too far to the left ("hogged out") with a fender of coal 3 to 5 feet in thickness left unmined on the right side next to the gob. This fender, under the circumstance, could have acted as a constraining factor within the pillar. Reportedly, 4 cuts of coal, including the cut cleaned up by the night-shift crew on the evening the bump occurred, had been mined in the pillar lift.

Effects of the outburst were confined to the immediate vicinity of No. 5 pillar as indicated with the greatest force being expended on the left side of the No. 5 pillar split and to a lesser degree in the face of the split as indicated by the expulsion of coal into the roadway. Timbers were knocked from under one end (next to the left rib line) of the 5 inby crossbars in the pillar lift by a combination of flying coal and the resultant shock wave; the floor was affected slightly at the entrance to the pillar split and to a greater degree in Road 526-D between Nos. 4 and 5 pillars. At the time of the outburst, Pack was assisting Alexander in sawing a timber and had his back toward the face of the pillar lift. He was thrown off his feet by the stress wave and received injuries as previously described. Alexander, who was within 3 feet of Pack at the time of the outburst,was not injured. Information from witnesses indicated that considerable dust was thrown into suspension in the immediate vicinity of the bump; however, the foreman reported that he did not detect methane with a flame safety lamp within the affected area immediately after the bump. The shock wave and tremor from the outburst evidently were not severe. The night mine foreman who was near the loading point (200 feet from the outburst) said he heard the sound of the outburst but did not perceive the tremor or shock wave. The section foreman was in the No. 2 entry when the outburst occurred and stated that he was not aware a bump had occurred until he was notified of the occurrence by an employee. The loading-machine crew members stated that they did not hear the bump but felt the floor tremor. The loading machine was operating at the time of the outburst in No. 4 pillar. A cut of coal had been blasted in No. 2 pillar and the cutting machine had cut the face of No. 1 pillar lift 20 and 10 minutes prior to the outburst, respectively.

Coal-mine outbursts, other than the normal degree of "bumping" experienced during pillar extraction operations, reportedly, had not occurred in the Road 526 Section, nor in either of the last 4 inby sections (Roads 527 to 530, inclusive); however, coal-pillar outbursts, accompanied by considerable intensity and force occurred during pillar mining in parts of Road 531 Section in 1956, about 1,250 feet inby the location of the outburst in No. 5 pillar Road 526 Section.

Pillar-mining methods at this operation since 1957 has been an outstanding example of successful pillar extraction. The pillar-mining plan requires that the cuts in the alternate open-end pillar lifts in the individual pillars be mined in numbered sequence and that the pillar extraction line be maintained on a 45-degree angle. The author has made several examinations of pillar mining practices and conditions from the coal-mine bump aspect since 1957 in this mine, and during the interim, the adopted pillar-mining plan was followed. Nevertheless, the cause of the minor coal outburst injury on

October 25, 1961 in the Road 526 pillar section is attributed specifically to the failure to follow the adopted pillar-mining plan. From Sketch B, it can be seen that the pillar involved in the outburst was not mined in proper sequence nor in proper alignment resulting in the pillar involved becoming the focus (critical area) of a pillar-line point, (a result of improper alignment), where, according to record, more than 67 percent of all coal-mine outbursts occur. A factor that probably inadvertently contributed to the circumstance or cause of the bump probably can be attributed to the fact that the general mine foreman, who is very zealous and vigilant in the daily supervision of the various pillar-mining sections, and one of the Road 526 section foreman were absent from duty for several days (because of illness) prior to the outburst. It is believed that under normal routine supervision, the pillar involved would have been mined in proper sequence and that the pillar line would have been maintained in proper alignment.

Following completion of the investigation made jointly by company officials and Bureau of Mines representatives, a conference was held in the mine foreman's office to discuss the outburst, and the following recommendations were discussed and submitted:

1. Pillars should be extracted in a straight line. Irregular pillar lines result in excessive pressures on any pillar line points thus formed. Experience has shown, however, that the lead (top end) of a pillar line can be kept slightly in advance without adverse affects.

2. The adopted pillar extraction sequence (numbered cuts) should be followed in mining the individual pillars.

3. The pillar lifts should be mined open-ended and be driven straight. (In some instances, where the roof is broken and may present a roof-fall hazard, a thin wing or fender is permissible.)

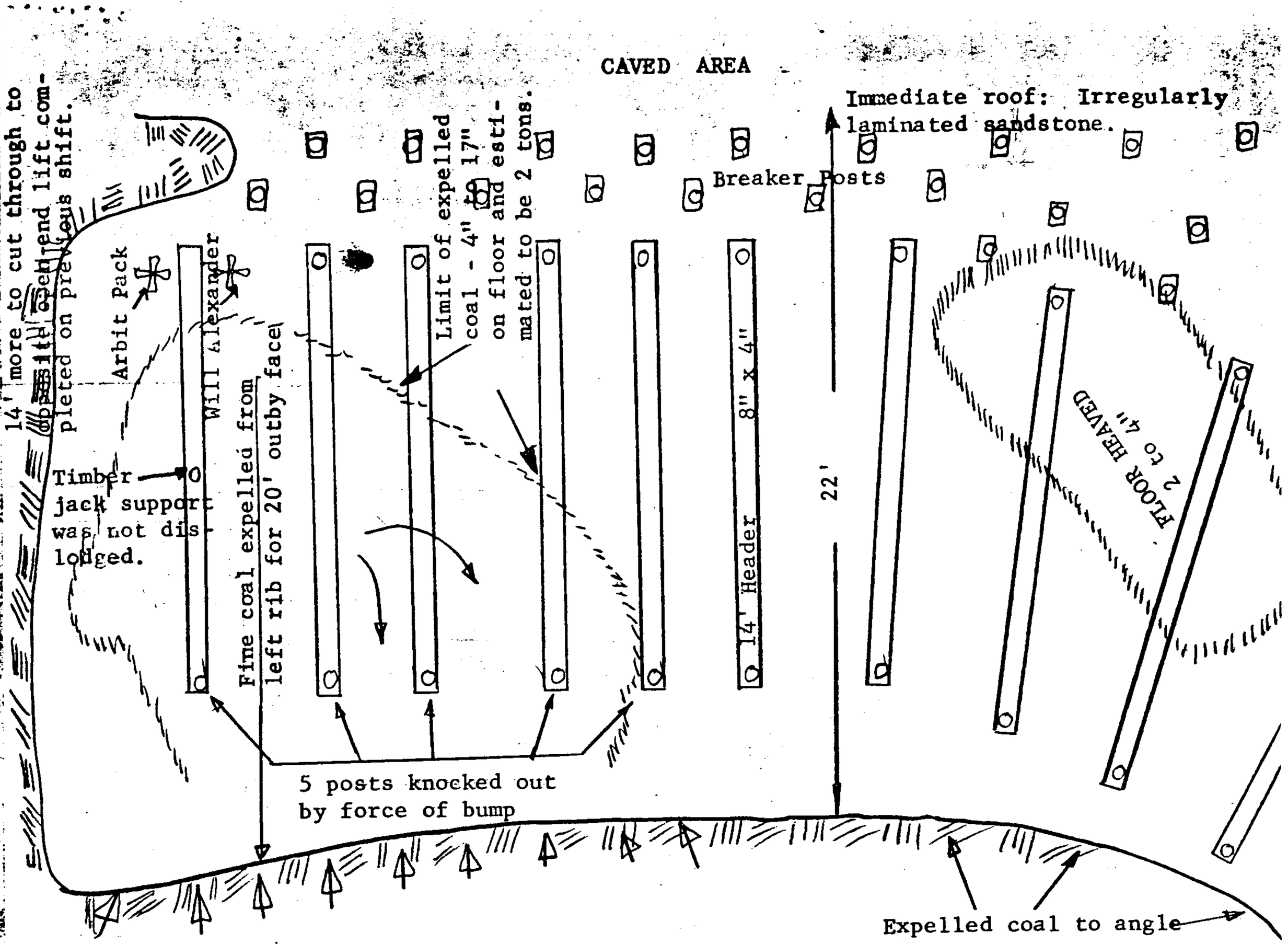
4. "Hogging" or digging the "loose" coal from the rib line or the face of lifts of stressed pillars usually results in tight corners outby the extraction line thus creating a potential bump condition, and such practice and/or violation of this company rule should not be permitted.

5. The plans of pillar extraction in this mine should be unequivocally understood by all concerned so as to eliminate any misunderstanding of responsible persons as to what is required.

The author gratefully acknowledges the courtesy and cooperation of the employees and officials during this investigation.

/s/ J. L. Gilley

J. L. Gilley



Eagle Coal Bed
64" thick

Scale 1" = 5'

MINOR COAL-MINE OUTBURST ACCIDENT
THE YOUNGSTOWN MINES CORP.
DEHUE MINE
DEHUE, LOGAN COUNTY, WEST VIRGINIA

October 25, 1961

Sketch A

SKETCH B

Rd. 527-C

Rd. 527-B

Rd. 527-A

Pillar to this line

16,684 feet to shaft bottc

Caved Area

2 timbermen

Rd. 527

Location of Accident
timber helper

Rd. 526-D

Shuttle car loading

1295' cover

Rd. 526-C

Joy operator and
helper loading

Shuttle car unloading

Rd. 526-B

Boom Man

Loading Boom

Coal shot approx.
20 min. before bump

Rd. 526-A

C. Mach. & Helper tramming

Shuttle car
supply hole

Foreman

Rd. 526

Shot firer
tamping hole

MINOR COAL-MINE OUTBURST ACCIDENT
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DEHUE MINE
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Rd. 510-E

Rd. 510-D

Scale 1" = 100'

Rd. 525-D